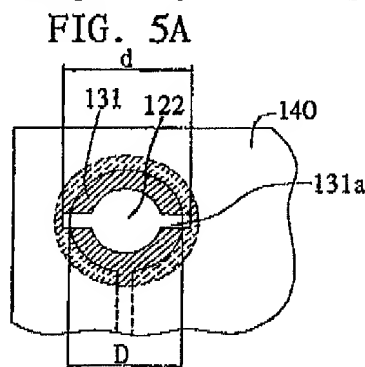


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with a via hole to expose a selected part of the heat sink; a ring-shaped ground-ball pad formed over the tape, the ring-shaped ground-ball pad formed with a plurality of air vents spaced substantially at equal radial intervals around the via hole and cut all the way into the tape until reaching the heat sink; and a solder mask formed over the tape, wherein a distance between outermost edges of the air vents is at least equal to a diameter of the unmasked ring-shaped ground-ball pad, so as to form an interspaced ring of the ground-ball pad and allow each of the air vents to extend outwardly from the via hole to a position beneath the solder mask.

The Applicants' invention is exemplified by the following copy of FIG. 5A.



As shown in FIG. 5A, ring-shaped ground-ball pad 131 is formed with a plurality of air vents 131a spaced substantially at equal intervals around via hole 122. The distance  $d$  between outermost edges of the air vents 131a is at least equal to a diameter  $D$  of the unmasked ring-shaped ground-ball pad 131, so as to form an interspaced ring of the ground-ball pad and allow each of the air vents to extend outwardly from the via hole 122 to a position beneath the solder mask 140. As shown in FIG. 3D, the outermost edges of the air vents 131a clearly extend beneath the solder mask 140, so that trapped air can escape in the direction of the arrows during a solder-reflow process.

The above-described package configuration and fabricating method can yield significant benefits. Because the distance  $d$  between respective outermost edges of the air vents is equal to or greater than the diameter  $D$  of the via hole and the outermost edges of the air vents extend beneath the solder mask, any air trapped in the pasted solder can exit through the air vents during

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a solder reflow process. As a result, the finished package would contain substantially no air-filled voids near the bottom of the via hole, and the ground ball would be fully collapsed against the heat sink and therefore coplanarized with a signal ball.

Claims 1-8 were rejected under 35 USC 103(a) as being unpatentable over "Applicant's Admitted Prior Art (APA)" in view of Japanese Publication 4-2195 to Kitamura (hereinafter "Kitamura"). This rejection is respectfully traversed.

As noted on Page 3 of the Office Action, the Background section of the application "does not show forming a pad with a plurality of air vents substantially at equal radial intervals around the via hole and cut all the way into the tape until reaching the heat sink..."

Kitamura fails to teach or suggest a plurality of air vents formed around the via hole where a distance between outermost edges of the air vents is at least equal to a diameter of the unmasked ring-shaped ground-ball pad. As shown in FIGS. 1 and 2 of Kitamura, a cross-shaped through hole 9a is formed within a land 10a, but the distance between outermost edges of the through hole 9a is less than the diameter of the land 10a. Therefore, if combined with the conventional TBGA package discussed in the Background, the protruding ends of the through hole 9a in Kitamura would not extend to a position beneath a solder mask.

It is believed the application is in condition for immediate allowance, which action is earnestly solicited.

Date: August 30, 2002

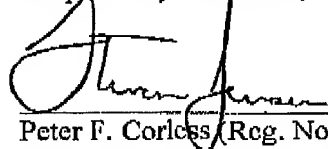
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AUG 30 2002

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